Can Paris deal boost SDGs achievement?
An assessment of climate-sustainabilty co-benefits or side-effects

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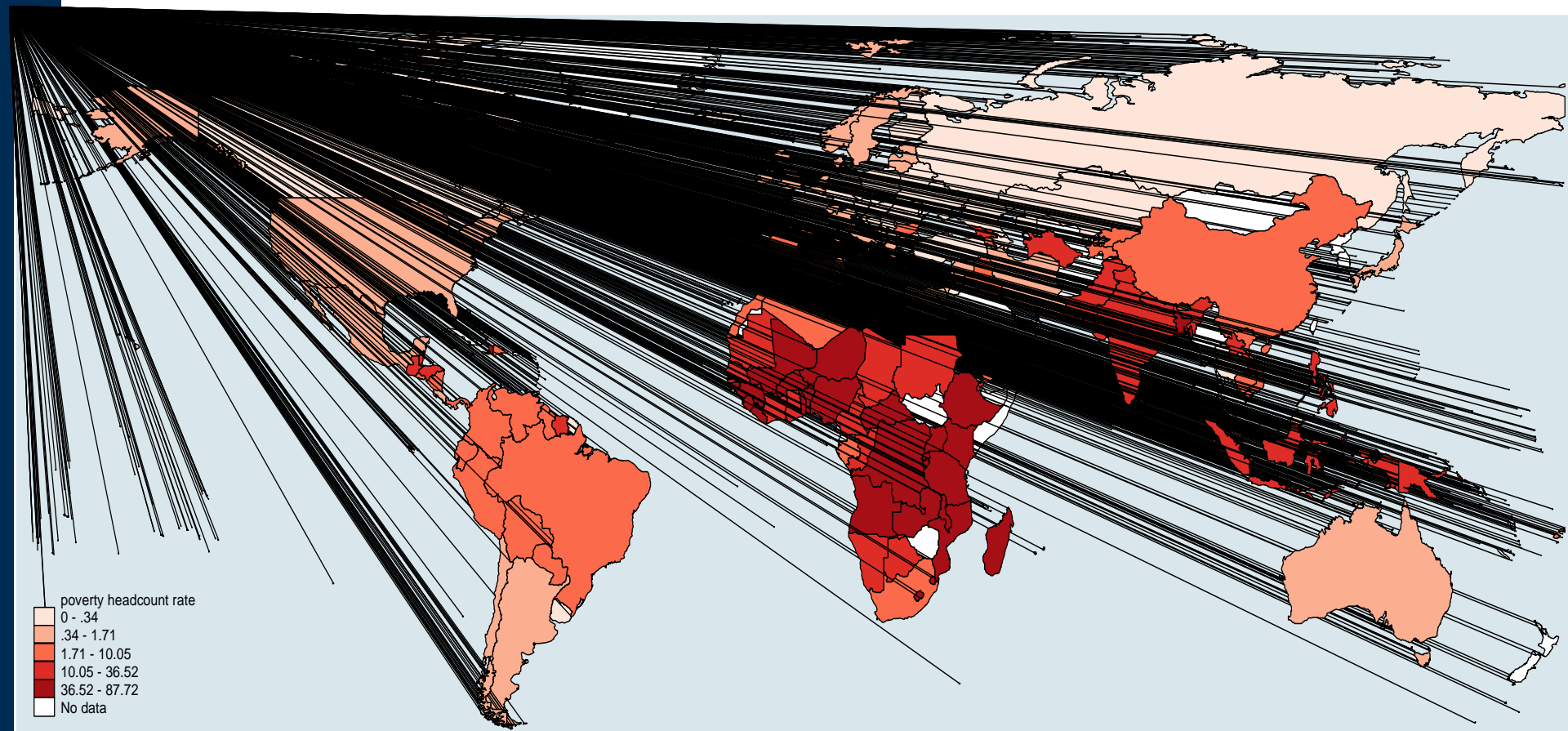
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Motivation

- 21th UNFCCC Conference Of Parties (COP 21) will aim to reach a binding global climate agreement grounded on the Intended Nationally Determined Contributions (INDCs)

- Sustainable Development Goals (SDGs) adopted in September 2015 by United Nations aim to shape the pathway towards an inclusive green growth

- How COP21 outcome will affect the path towards achieving SDGs?

- Focus on extreme poverty and inequality indicators which are the core of SDG1 and SDG10, in addition to the usual environmental indicators on GHG emission reduction and clean energy use

- The chosen approach couples an empirical analysis with a CGE model

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Outline

- Overview of past trend of poverty and inequality

- Main drivers of poverty and inequality change

- Baseline scenario description

- Climate policy under different recycling schemes

- Future path of poverty and inequality in the policy scenarios
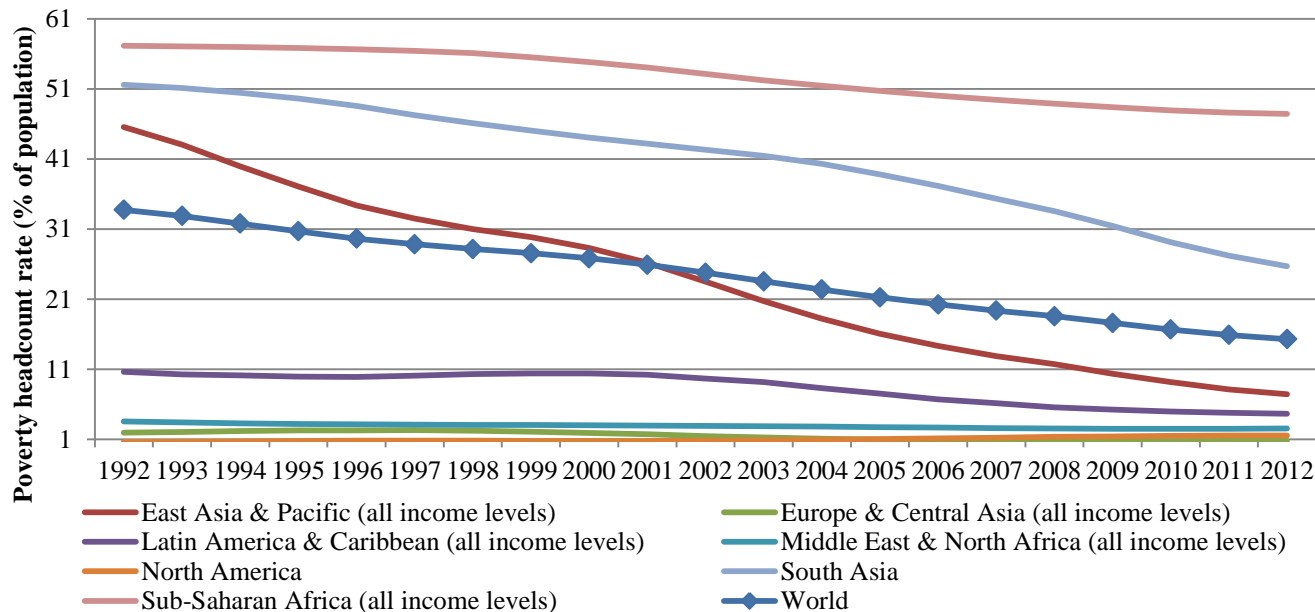
- Conclusions and further steps

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Poverty headcount rate at $1.25 a day (PPP) (% of population)

poverty headcount rate
- 0 - .34
- .34 - 1.71
- 1.71 - 10.05
- 10.05 - 36.52
- 36.52 - 87.72
- No data

Source: WDI database

- 836 million people live with less than $1.25 a day (WB, 2015)

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Past trend of poverty and inequality 1990-2012 (WDI, WB)

Poverty headcount rate (% of population)

Legend:
East Asia & Pacific (all income levels)
Europe & Central Asia (all income levels)
Latin America & Caribbean (all income levels)
Middle East & North Africa (all income levels)
North America
South Asia
Sub-Saharan Africa (all income levels)
World

Between 1990 and 2012, around 800 million people moved outside of extreme poverty (-43%)

At global level, the Palma ratio average slightly decreases from 2.2 in 1992 to 1.79 in 2012

Palma ratio

Legend:
East Asia & Pacific (all income levels)
Europe & Central Asia (all income levels)
Latin America & Caribbean (all income levels)
Middle East & North Africa (all income levels)
North America
South Asia
Sub-Saharan Africa (all income levels)
World
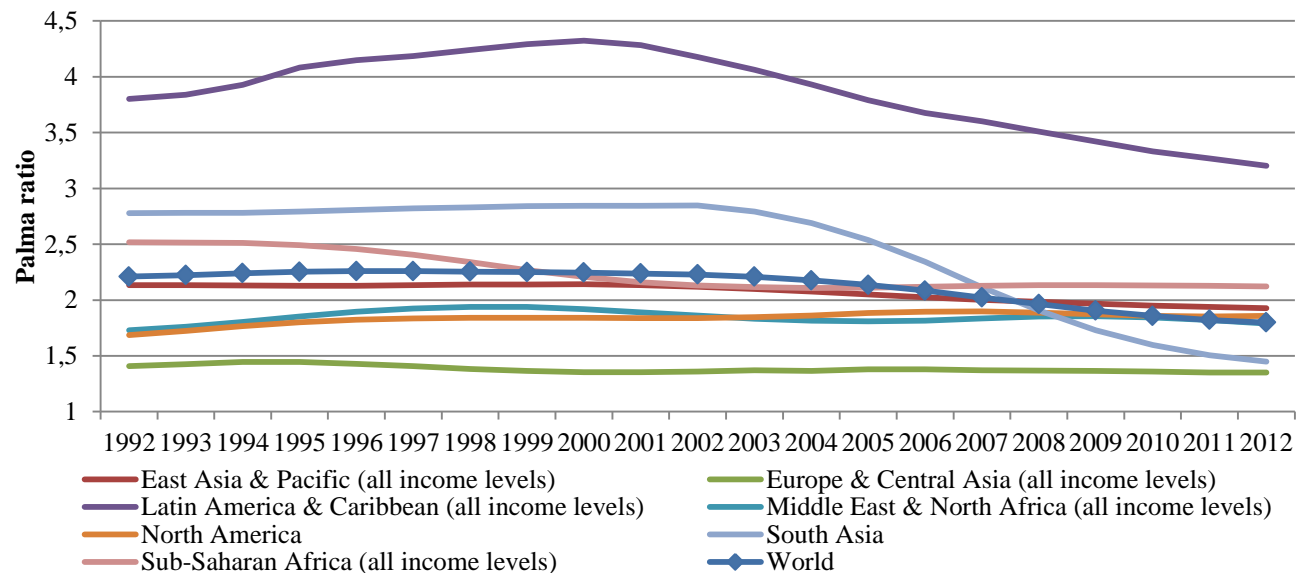
Evidences on poverty determinants

- **Empirical literature** from a cross-country perspective highlights as main drivers:
  - ✓ The growth of average income per capita (Ravallion and Chen, 1997)
  - ✓ The distributional change (Ravallion, 1997, 2001; Heltberg, 2002; Bourguignon, 2007)
  - ➡ Growth elasticity of poverty and inequality elasticity of poverty

- **Country-specific empirical analyses** consider as drivers:
  - ✓ Sectoral growth patterns (Ferreira et al., 2007; Montalvo and Ravallion, 2010)

- **CGE modelling literature:**
  - ✓ Micro-simulation approach
  - ✓ Multi-household approach

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Evidences on inequality determinants

- **Empirical cross-country studies**:
  - ✓ differential in labor productivity between agricultural and non-agricultural sectors (Bourguignon and Morrison, 1998)
  - ✓ sectoral wage differentials between skilled and un-skilled labor (Bourguignon et al., 2005)
  - ✓ globalization, education attainments and policy (Alvaredo and Gasparini, 2015)

- **CGE modelling perspective:**
  - Multi-Household approach
  - Usually assumed constant

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Predicting inequality and poverty

- The considered period spans from 1990 to 2012 (WDI database, WB)
- 3 independent panel regressions using country fixed effect model with robust and panel-corrected standard errors

Inequality determinants

	$y_{i,t}^{low\,40}$	$y_{i,t}^{high10}$
$PEduExp\_sh_{i,t-1}$	0.0232**	-0.0235***
	(0.016)	(0.002)
$\ln(AgriVA\_sh_{i,t-1})$	0.0619**	-0.0392*
	(0.040)	(0.080)
$\ln(IndVA\_sh_{i,t-1})$	0.1277*	-0.0998
	(0.088)	(0.120)
$Corrupt\_cntr_{i,t}$	0.0319	-0.0196
	(0.126)	(0.290)
$Unempl_{i,t-1}$	-0.0040*	0.0027
	(0.054)	(0.155)
$d\_c\_i_{I,t}$	0.0180	0.0134
	(0.480)	(0.634)
t	0.0082***	-0.0057***
	(0.000)	(0.000)
$Constant$	-13.5050***	14.5225***
	(0.000)	(0.000)
Observations	661	661
Number of country	120	0.199

Robust pval in parentheses
*** p<0.01, ** p<0.05, *p<0.1

Poverty determinants

	$\ln(POV_{i,t})$
$\ln(GDPPPPpc_{i,t-1})$	-2.2651***
	(0.000)
$Palma_{i,t-1}$	0.2159***
	(0.000)
$Constant$	22.9492***
	(0.000)
Observations	521
Number of country	101

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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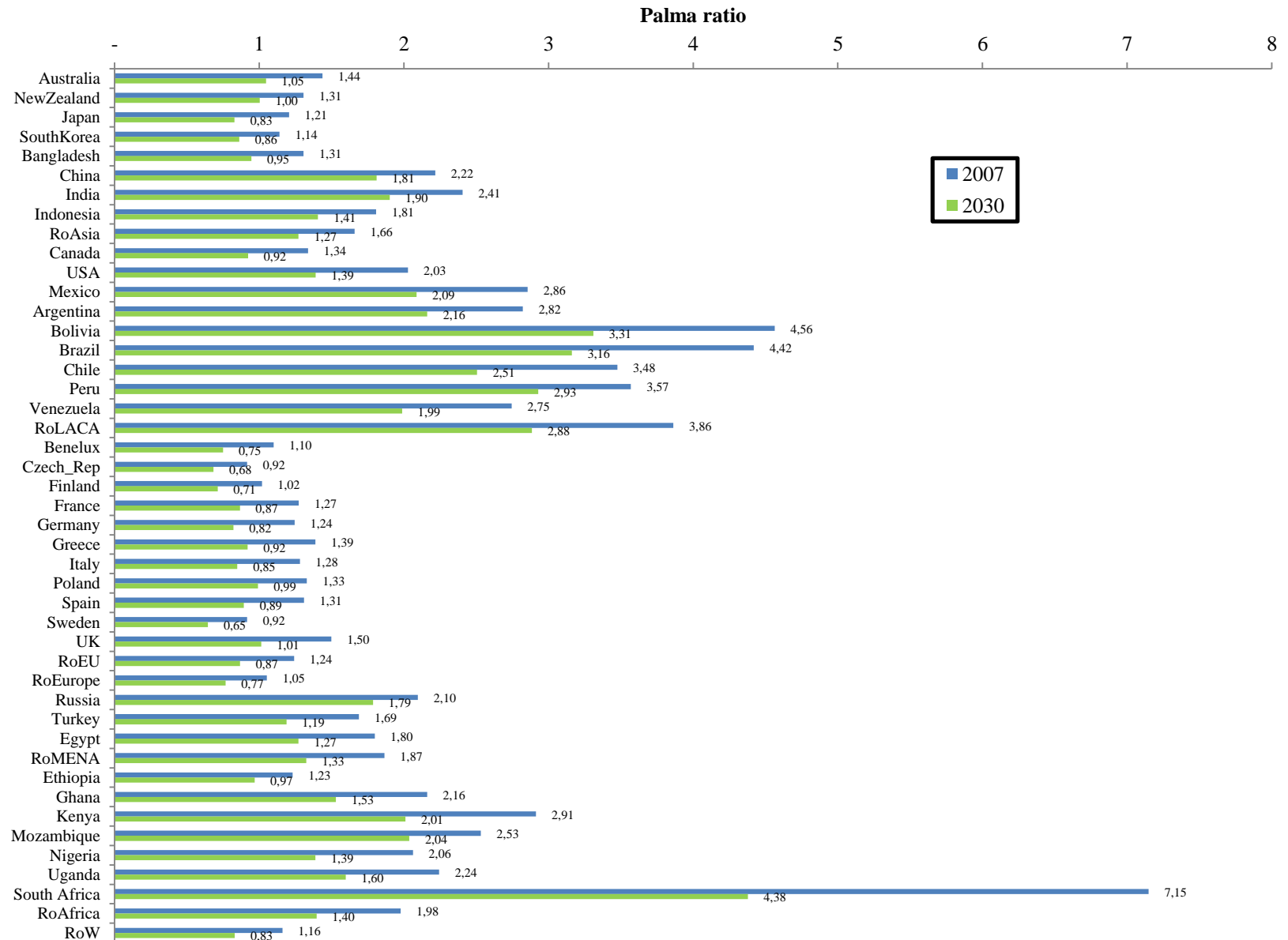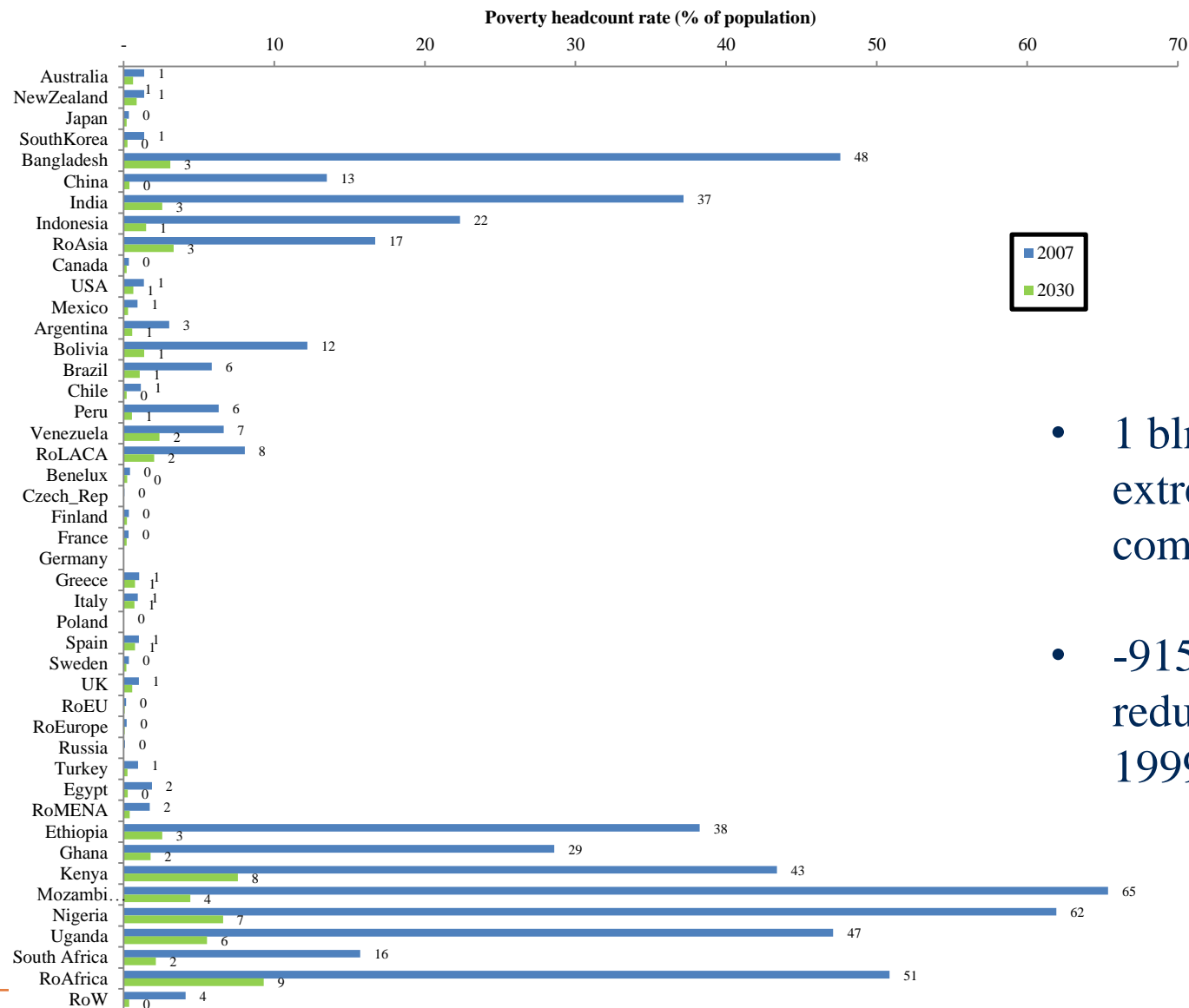ENRICO MATTEI

ICES model and baseline scenario

- The ICES model (Eboli *et al.*, 2010) is a recursive-dynamic General Equilibrium model, relying upon the GTAP-E structure (Burniaux and Troung, 2002)

- Medium term analysis: 2007-2030

- Scenario SSP2: medium population growth and medium GDP growth

- 45 countries and 22 sectors considered

- Poverty and inequality change is directly driven by changes of endogenous variables of ICES model

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Inequality change in the baseline scenario (2007 vs. 2030)

Palma ratio

Country	2007	2030
Australia	1,44	1,05
NewZealand	1,31	1,00
Japan	1,21	0,83
SouthKorea	1,14	0,86
Bangladesh	1,31	0,95
China	2,22	1,81
India	2,41	1,90
Indonesia	1,81	1,41
RoAsia	1,66	1,27
Canada	1,34	0,92
USA	2,03	1,39
Mexico	2,86	2,09
Argentina	2,82	2,16
Bolivia	4,56	3,31
Brazil	4,42	3,16
Chile	3,48	2,51
Peru	3,57	2,93
Venezuela	2,75	1,99
RoLACA	3,86	2,88
Benelux	1,10	0,75
Czech_Rep	0,92	0,68
Finland	1,02	0,71
France	1,27	0,87
Germany	1,24	0,82
Greece	1,39	0,92
Italy	1,28	0,85
Poland	1,33	0,99
Spain	1,31	0,89
Sweden	0,92	0,65
UK	1,50	1,01
RoEU	1,24	0,87
RoEurope	1,05	0,77
Russia	2,10	1,79
Turkey	1,69	1,19
Egypt	1,80	1,27
RoMENA	1,87	1,33
Ethiopia	1,23	0,97
Ghana	2,16	1,53
Kenya	2,91	2,01
Mozambique	2,53	2,04
Nigeria	2,06	1,39
Uganda	2,24	1,60
South Africa	7,15	4,38
RoAfrica	1,98	1,40
RoW	1,16	0,83

Poverty change in the baseline scenario (2007 vs. 2030)

Poverty headcount rate (% of population)

- 1 bln people get out extreme poverty compared to 2007

- -915 ml people: poverty reduction in the period 1999-2015

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Climate policy: INDCs

Climate policy scenarios consider the INDCs as binding targets

| Country	Emissions reduction target	Reference year	Target year
Australia	26-28%	2005	2030
Argentina	15%	BAU	2030
Bangladesh	5%	BAU	2030
Brazil	43%	2005	2030
Canada	30%	2005	2030
Chile	30-45% GHG/GDP	2007	2030
China	60-65% GHG/GDP	2005	2030
Ethiopia	64%	BAU	2030
EU	40%	1990	2030
India	33 – 35% GHG/GDP	2005	2030
Indonesia	29%	BAU	2030
Japan	26%	2013	March, 2031
Kenya	30%	BAU	2030
Mexico	22-36%	BAU (2013)	2030
New Zealand	11%	1990	2030
Peru	30%	BAU	2030
Russia	25-30%	1990	2030
South Korea	37%	BAU	2030
Turkey	21%	BAU	2030
Uganda	22%	BAU	2030
USA	26-28%	2005	2025

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Climate policy scenarios

- **MPOLICY scenario**: considering the INDCs as binding targets:
  - ➢ EU28 achieves its target through an Emission Trading Scheme (EU-ETS)
  - ➢ The other countries impose a carbon tax
 - ➢ Internal recycling of the revenues

Same mitigation scenario but with different revenue recycling schemes:
- **MPOLICY+LDCFUND scenario:**
  - ➢ Creation of a International Green Climate Fund (GCF) that reaches 100 billion in 2020
  - ➢ OECD and East European countries contribute to GCF recycling a share of their carbon tax revenues
  - ➢ LDC countries receives a lump-sum transfer from the GCF (inversely proportional to their GDP p.c.)
- **MPOLICY+LDCFUND_SUB scenario:**
  - ➢ In LDCs the transfer from the Fund is used to subsidise Clean Electricity, Water, R&D and Public Services (excl. Education and Health)
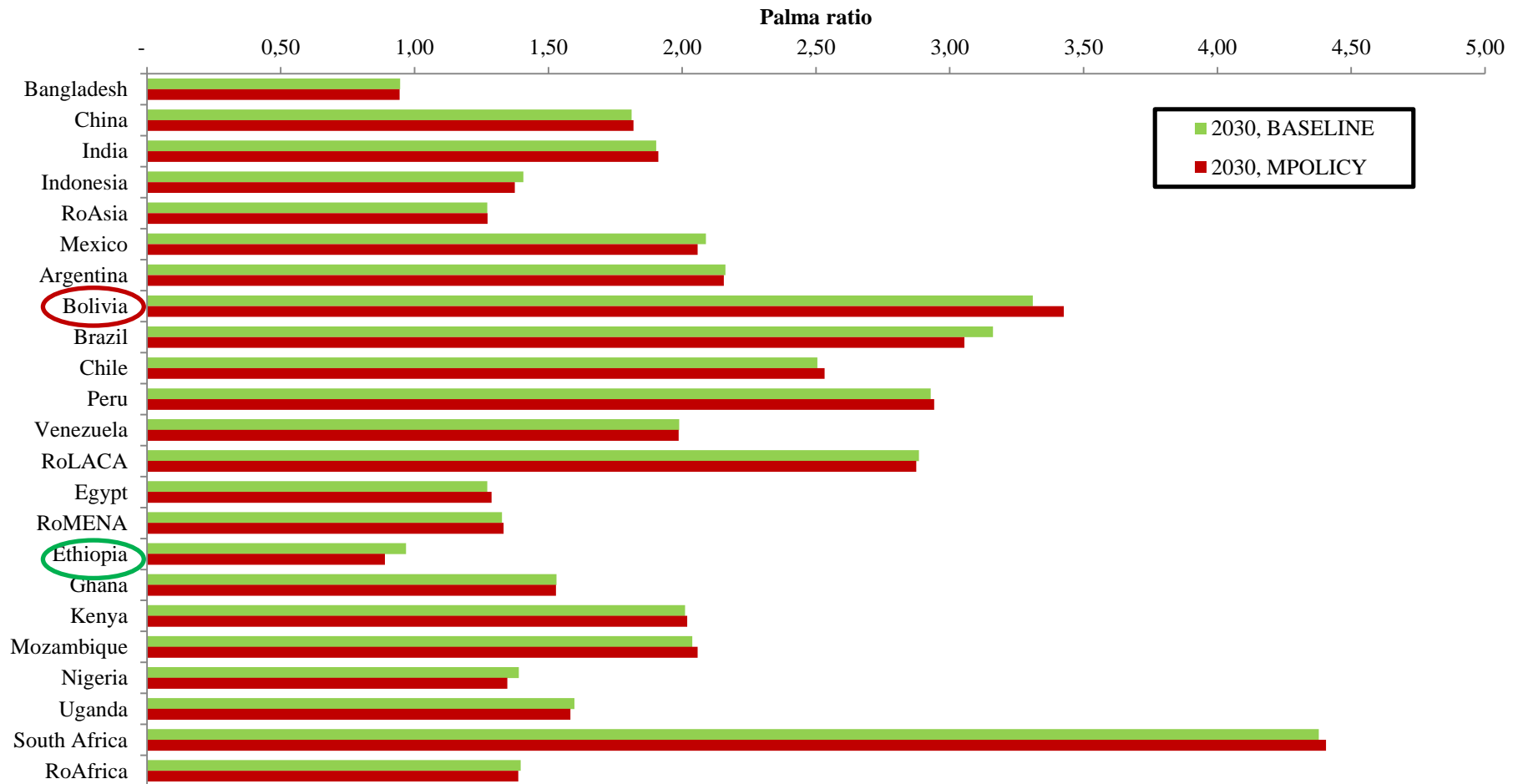
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Stringency of the mitigation targets
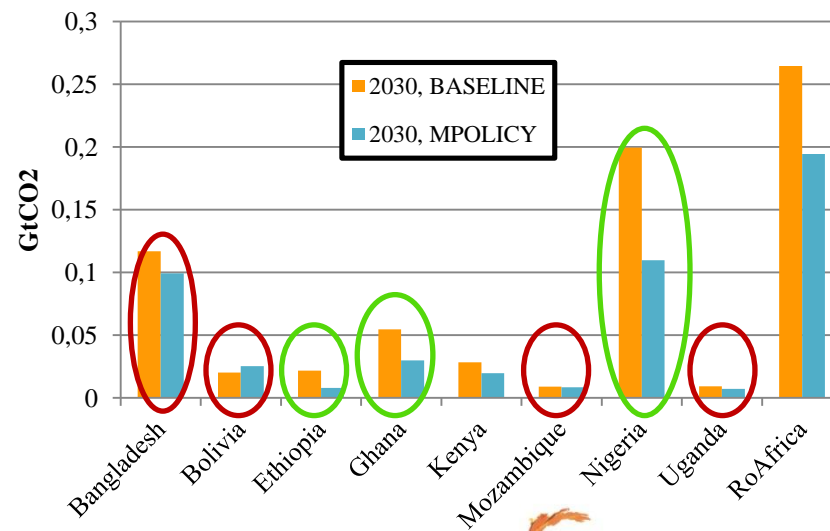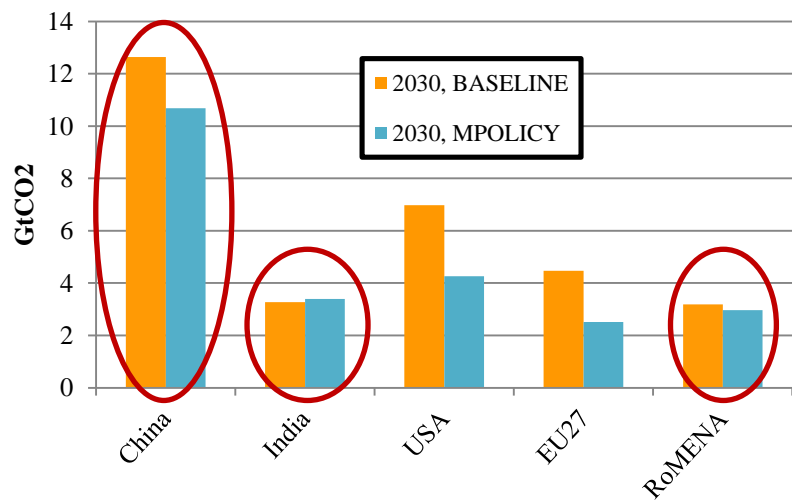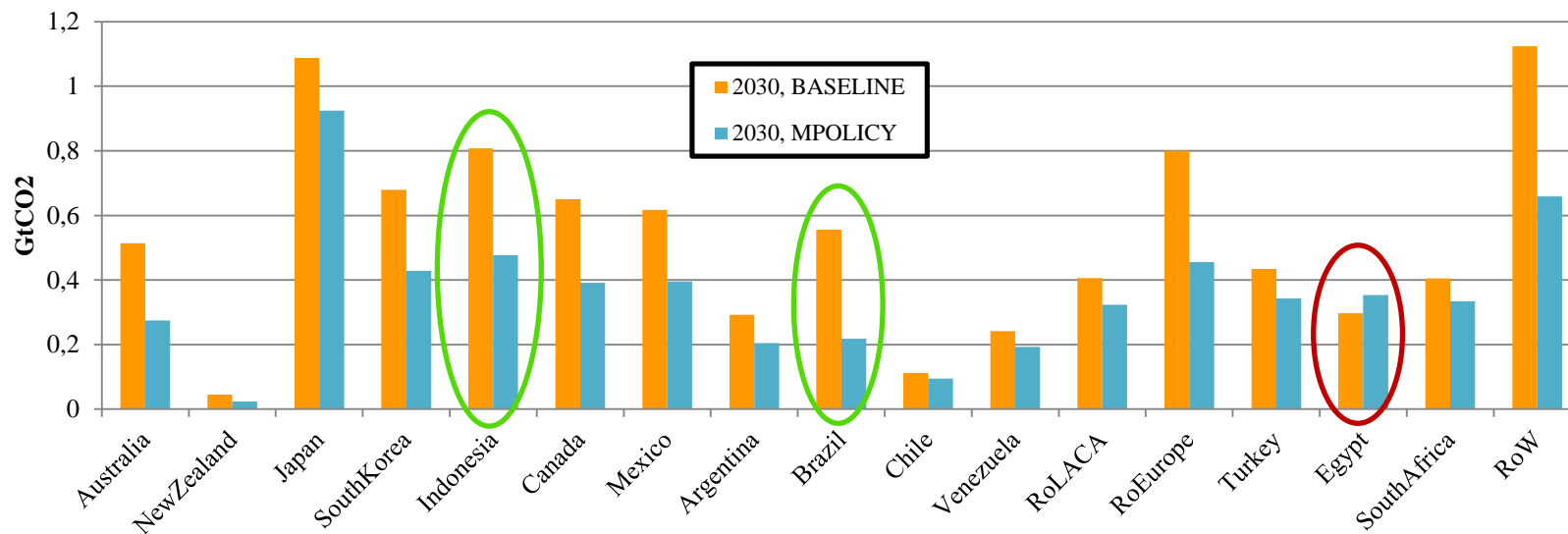
Mitigation policy costs in 2030
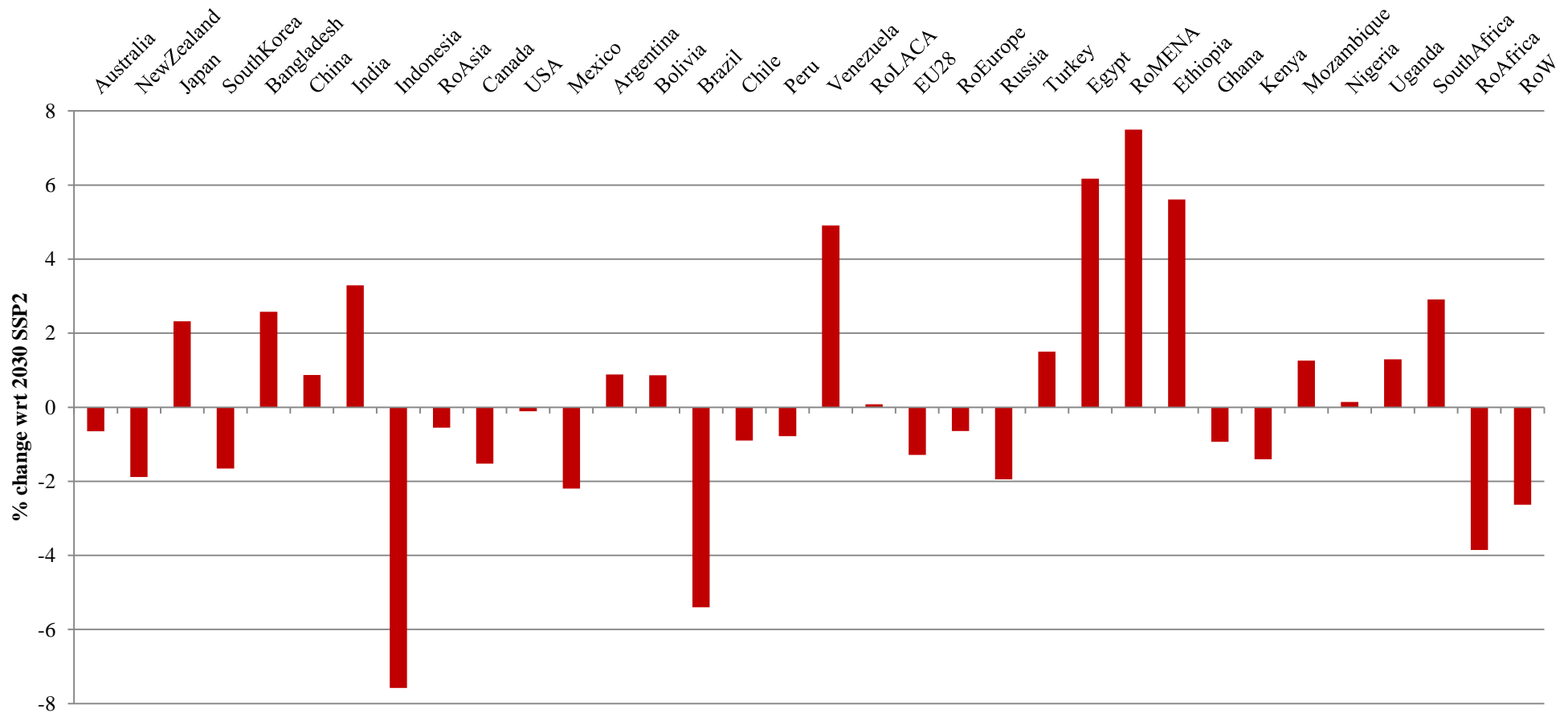
- GHG emissions reduce of 16% with respect to the 2030 baseline scenario

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Effect of mitigation scenario on inequality

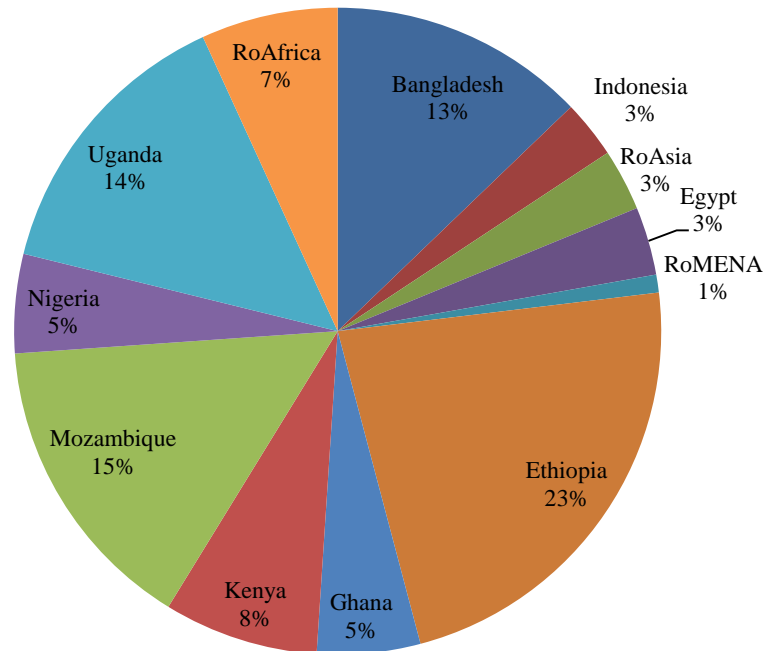- Countries with stronger mitigation contributions show a small reduction of inequality

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Effect of mitigation scenario on poverty prevalence

Poverty headcount rate (% of population) in 2030 under different scenarios

Legend:
- 2030, BASELINE
- 2030, MPOLICY

Countries (top to bottom): Bangladesh, China, India, Indonesia, RoAsia, Mexico, Argentina, Bolivia, Brazil, Chile, Peru, Venezuela, RoLACA, Egypt, RoMENA, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Uganda, South Africa, RoAfrica
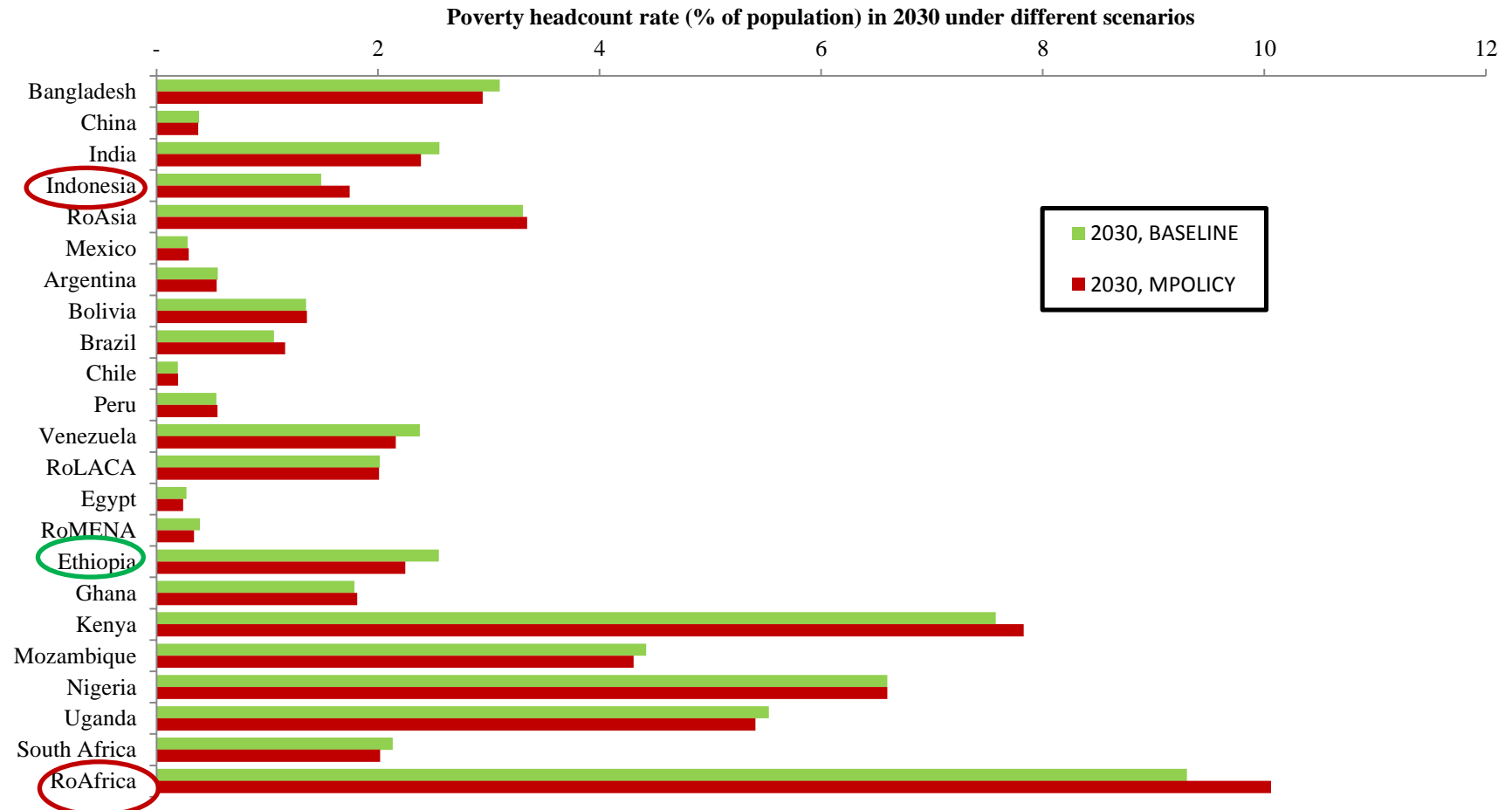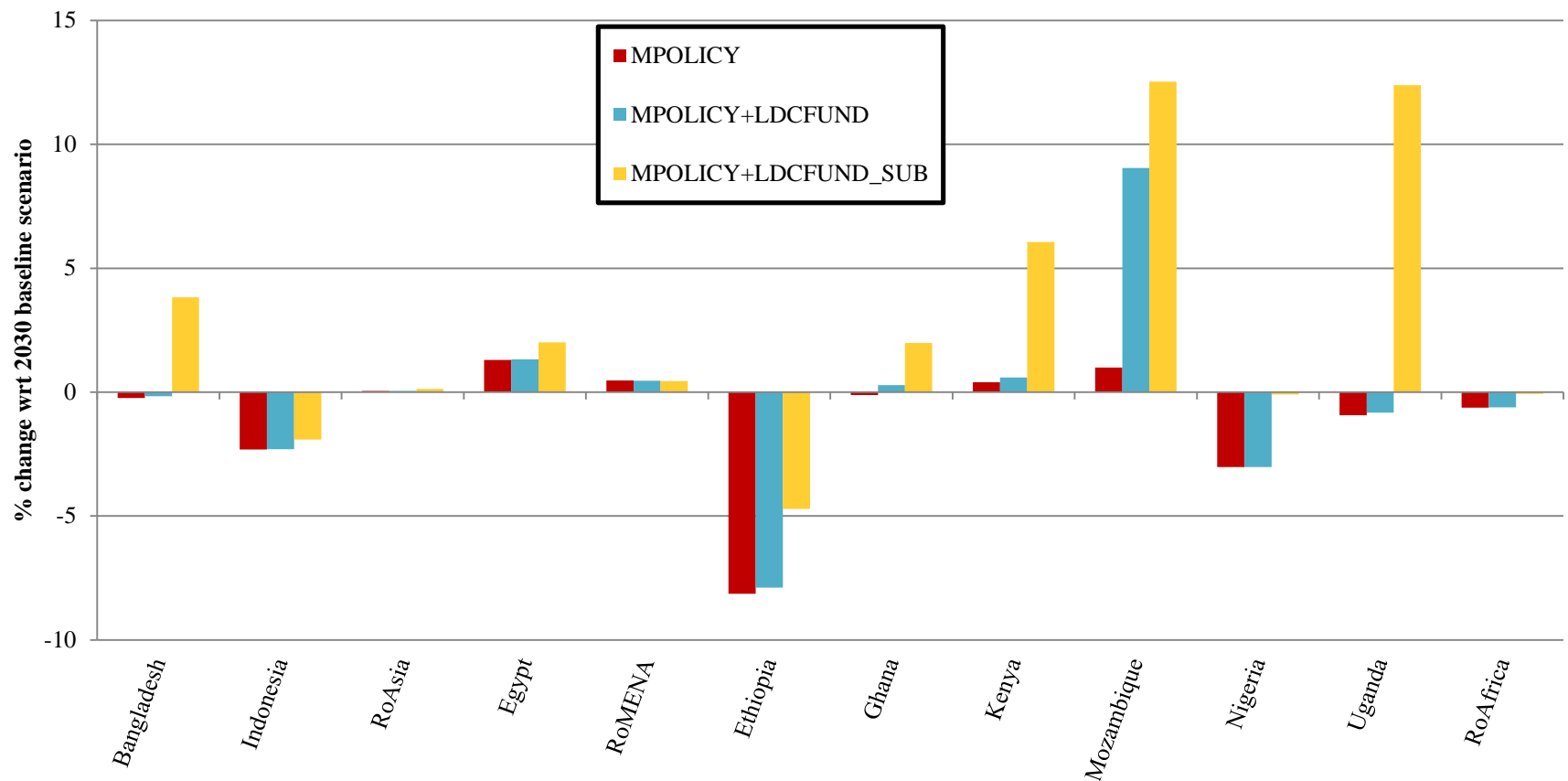
- The outcome in term of poverty prevalence reduction is mixed and depends on the composition of income and inequality effects of the policy

Development Fund

- The Green Climate Fund reaches 100 bln$ in 2020 and then remain constant

- EU28 countries revenues account for 56% of the Fund

Pie chart:
- Bangladesh 13%
- Indonesia 3%
- RoAsia 3%
- Egypt 3%
- RoMENA 1%
- Ethiopia 23%
- Ghana 5%
- Kenya 8%
- Mozambique 15%
- Nigeria 5%
- Uganda 14%
- RoAfrica 7%

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Effect of different recycling schemes on inequality

- Transfers from Green Climate Fund to LDCs increase inequality
- Subsidies on clean energy, water, R&D sectors push their production at the expenses of inequality-reduction sectors (e.g. education and light industry)

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Effect of different recycling schemes on poverty
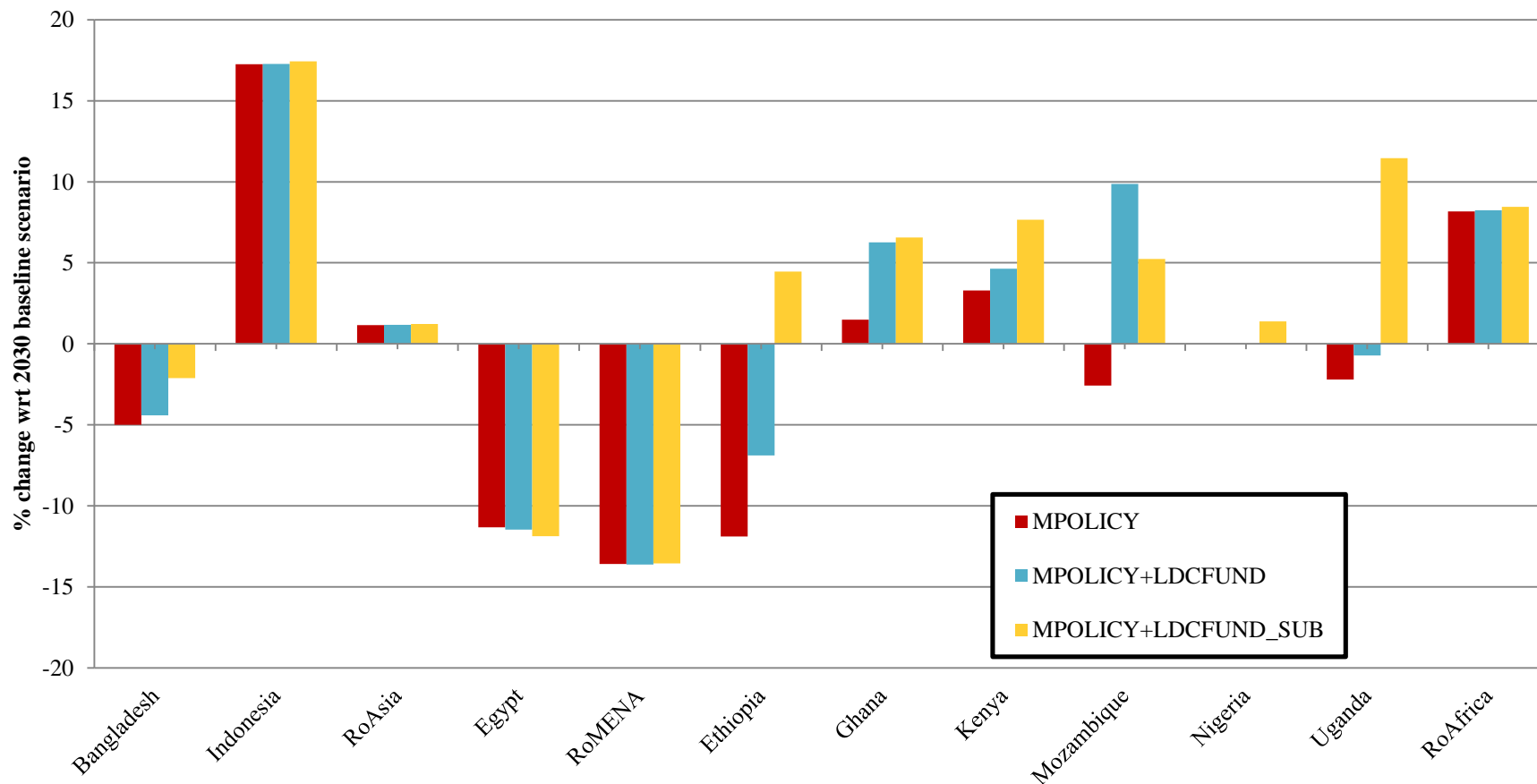
- Transfers from Green Climate Fund to LDCs increase poverty prevalence in most of countries due to the higher inequality and lower GDP growth
- Benefits of mitigation policies (reduction of climate change impacts) are not considered

Conclusions

- Linking empirically SDGs indicators to a CGE model allows assessing future trend of these indicators under different scenarios and policy interventions

- Considering the INDCs as binding targets, COP21 agreement will determine:
    - ✓ a positive effect on inequality reduction the more ambitious is the climate mitigation commitment (synergies between climate policy and inequality)
    - ✓ a slight increase of extreme poverty prevalence in the LDCs

- Recycling carbon revenues with the creation of a Green Climate Fund for LDCs worsen the outcome in terms of poverty and inequality for most of the countries, but
    - ✓ we are only considering the costs of mitigation policy and not the benefits (lower climate change impacts)
    - ✓ The Green Climate Fund has to be coupled and can not replace a Development Fund aiming to achieve SDGs by 2030

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Further steps

- Extend the empirical analysis of historical data on inequality and poverty:
    - other databases on income distribution (WIID)
    - different approaches (short run and long run elasticities of poverty and inequality)
    - use a lognormal approximation of initial income distribution

- Consider different SSPs scenarios

- Take into account different recycling schemes

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Thank you for your attention!

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Effect of different recycling schemes on GDP